EMWIN Stakeholder Presentation
August 30, 2016

Emergency Managers Weather Information Network (EMWIN) Service Transition 2016/2017

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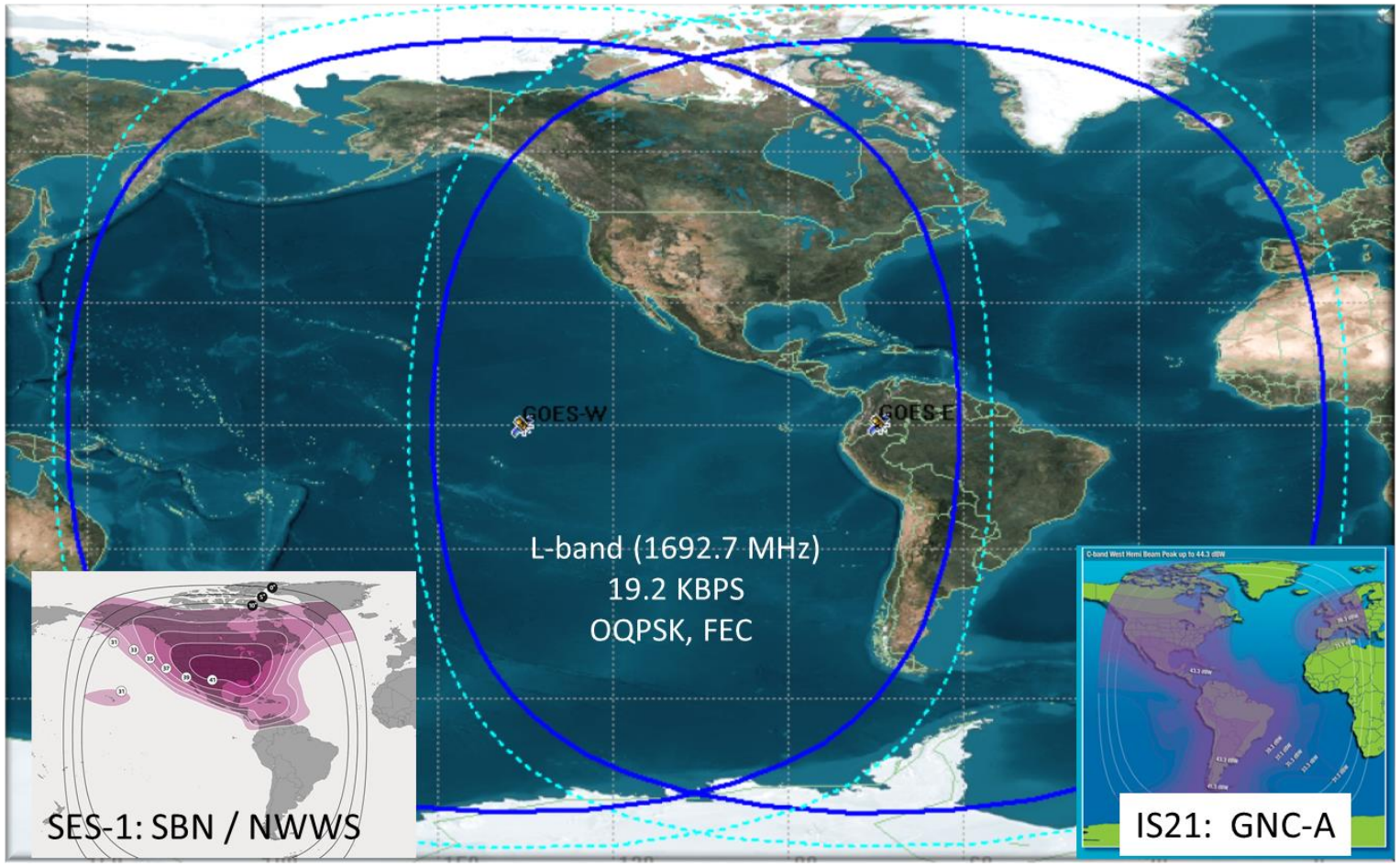
Agenda

- **Introduction / Overview**
- GOES-R HRIT/EMWIN Broadcast and Reception
- EWMIN GOES-R File Broadcast Format and Naming Convention
- EMWIN ByteBlaster - Internet File Push
- EMWIN FTP Server - Internet File Pull
- Events Calendar and Footnotes
- Questions

EMWIN Overview

- Was developed in partnership with the National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS), and other public and private organizations
- Provides open public access without fee, to a managed set of US National and World Meteorological Organization (WMO) International warnings, watches, forecasts, and other products.
- Sequences highest-priority/most-urgent products ahead of all lower priorities products
- Supplements other US NOAA/NWS dissemination services, including:
  - NESDIS GEONETCast Americas (GNC-A) satellite broadcast service
  - NOAA Weather Wire System (NWWS) satellite broadcast and Internet services
  - SBN-NOAAPORT Broadcast System
  - NOAA Weather Radio (NWR) VHF Broadcast Service
  - NWS Information Dissemination Service (NIDS) Internet Services
  - NWS Global Telecommunication System (GTS) Internet File Service (GIFS)

GOES Satellite Footprint
Extent of EMWIN Broadcast



EMWIN Dissemination Platforms and Stakeholders

- EMWIN Dissemination Platforms:
  - Satellite broadcast : NESDIS GOES East and West Satellites
  - Internet File Push: EMWIN ByteBlaster client/server file dissemination service
  - Internet File Pull: EMWIN File Transfer Protocol (FTP) server

- Stakeholders:
  - EMWIN, LRIT and GOES-R HRIT/EMWIN Broadcast Interface Community
    - Broadcast Receivers and Antenna Systems
  - Application Software Community
  - Information End User Communities:
    - US National Users – Government, commercial, public and private
    - WMO Regional Association IV (RA-IV) Member States
    - Adjacent WMO Regions (RA-III and RA-V; Pacific Ocean Region)

EMWIN Broadcast Product List and Product Sources

- EMWIN text products listing: http://www.nws.noaa.gov/iscs/baseline.html
- EMWIN image products listing:
  http://www.nws.noaa.gov/emwin/EMWIN_Image_and_Text_Data_Capture_Catalog-DRAFT.pdf

- EMWIN product/bulletin sources:
  - US local/national/regional/global products - NWWS product stream.
    - US NWS Weather Forecast Offices / River Forecast Centers
    - US National Centers: Tsunami Warning Centers, National Hurricane Center, etc.
  - International bulletins received by the RTH/GISC -Washington
  - Selected weather image products from internet sources (e.g., US Weather Radar mosaics, GOES images, etc.).

Why EMWIN is Transitioning …

- NESDIS is preparing to replace a GOES-N series satellite with a GOES-R series satellite.
  - GOES-R is scheduled for launch November 2016; operational in 2017.
  - GOES-R HRIT/EMWIN transponder - replace - GOES-N EMWIN transponder.
- NWS is consolidating the management of dissemination services, under a program called the Integrated Dissemination Program (IDP)
  - Objective: sustainable, consolidated enterprise architecture; reduced costs
  - Operations centers located in:
    - College Park, MD
    - Boulder, CO
- IT Security threats require NOAA to periodically updating controls and procedures to minimize the risk of potential EMWIN operational impacts.

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Transitioning HRIT/EMWIN from GOES-N to GOES-R (NESDIS-1)

- Improved data products for hemispheric retransmission
  - Faster full disk images: between 15 and 30 minutes
  - Warnings, Watches, Tropical Storm Information
  - Copy of GOES Data Collection System (GOES DCS)

- Requires new antenna and receiver hardware
  - Receiver frequency shift to 1694.1 MHz from:
    - EMWIN 1692.7 MHz and LRIT 1691.0
  - BPSK Modulation; EMWIN shift from Offset QPSK
  - Data Rate to a combined 400 Kilobits per Second from: EMWIN: 19.2 Kbps and LRIT : 128 Kbps (combined 147.2)

NOTES: GOES-R: HRIT = High Rate Information Transmission ~ 400 kbps (combined transmission rate)
GOES-N: LRIT = Low Rate Information Transmission ~ 128 kbps

HRIT/EMWIN Downlink Characteristics (NESDIS-2)

- Coding – BPSK
  - Convolutional rate ½ code with constraint length 7 concatenated with Reed Solomon (255,223) with Interleave = 4
  - Square Root Raised Cosine filtering using an Alpha factor of 0.3
  - The resulting "Necessary Bandwidth" for this signal will be 1.205 MHz
- Modem Required: predicted C/No is in the range of 63-67 dB
- Maximum Demodulator Required is -
  - Eb/No is 4.6 dB for a BER of $1x10^{-8}$ after decoding
- Minimum Antenna System
  - At 5 degree elevation, the minimum antenna is 1.2 meter.
  - At 10 degrees or more elevation the minimum size is 1.0 meter
  - Using a LNA or LNB with a system noise temperature of about 200 K will provide a G/T of 1.0 dB/K or -0.3 dB/K respectively

Transition from LRIT and EMWIN to HRIT/EMWIN (NESDIS-3)

	LRIT / EMWIN On GOES –N Series	HRIT/EMWIN On GOES-R Series
Full Disk, NH, SH images	3 Hourly Full Disk; .5 hour NH/SH; follows GOES East/West Schedule. RSO issue	Variable but planned 3 Channels of Full Disk every 15 minutes
Modulation	LRIT BPSK EMWIN offset QPSK	BPSK
Receiver Center Frequency	LRIT 1691.0 MHz (L-Band) EMWIN 1692.7 MHz (L-Band)	1694.1 MHz (L-Band)
Data Rate	LRIT 128 Kbps EMWIN 19.2 Kbps	400 Kbps
Antenna Coverage	Earth Coverage to 5^0	Earth Coverage to 5^0
Imagery Data Sources	GOES-N Imager (IR,VIS,WV) MTSAT Imager	ABI (3 or more bands) HBI (3 bands hourly-GOES W
EMWIN Products	Full Suite of Current Products	Combined w/ LRIT Products
GOES DCS	Copy of DCS observations	Copy of observations

HRIT/EMWIN Summary (NESDIS-4)

- HRIT/EMWIN will provide at least 3 channels of GOES-N and / or GOES-R imagery along with warnings, watches and forecast products along with a copy of the GOES-DCS (Data Collection System) observations
- New data rate, center frequency and modulation (EMWIN Users)
- Ground receive stations are Commercial Off-The-Shelf utilizing a 1 – 1.2 meter antenna
- Documents and updates to be posted on the GOES-R web site:
  - http://www.goes-r.gov/
  - http://www.goes-r.gov/users/hrit.html

HRIT/EMWIN Reception

- Sources for HRIT/EMWIN systems and components:
  - Some LRIT receiver manufacturers are offering HRIT/EMWIN receivers.

  Ref: http://www.noaasis.noaa.gov/NOAASIS/ml/manulst.html
  - EMWIN system modifications may provides an alternative to replacing an entire system. Information on the fabrication of Intermediate Frequency (IF) and Radio Frequency (RF) digitizer boards, and use of software radios may be found on line:

  Ref: http://www.goes-r.gov/users/hrit-links.html

- US Government auction of L-band frequency spectrum (1695 to 1710 MHz) adjacent to GOES-R HRIT/EMWIN transponder frequency is likely to adversely impact the reliability of HRIT/EMWIN signal reception in the US due to cell phone interference.
  - Cannot accurately quantify the interference, or identify when the spectrum will be occupied.
  - Preliminary interference analysis will be revisited when the specific service characteristics are better known.

  http://satelliteconferences.noaa.gov/2015/doc/presentation/Session%204/4.4e%20Future%20EMWIN%20Implications%20R1_Valles.pptx
  - US Government is investigating options to improve operations in a shared spectrum environment
  - RF protection zones granted by the FCC were not offered to non-Federal sites/systems/users.
  - Users may employ methods for minimizing interference (e.g., blocking source of interference)

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EMWIN GOES-R File Broadcast Format and Naming Convention

- EMWIN Product Broadcast Format.
  - GOES-R: contiguous file on the HRIT/EMWIN broadcast.
  - GOES N: Quick Block Transfer (QBT) protocol packet transmission, where every file is broken into multiple 1024-byte segment
- File Rebroadcast. EMWIN Priority 1 and 2 products will be broadcast twice approximately 5 seconds apart, to help assure product reception in marginal or noisy radio frequency environments.
- File Names. The EMWIN file naming convention has been revised to follow the WMO format identified in WMO Pub 386.
  - EMWIN GOES-N broadcast example:

radgrtlk.gif

  - HRIT/EMWIN GOES-R broadcast examples:

A_FXUS65KABQ121804AAB_C_KWIN_201601121809_008996-2-AFDABQNM.TXT

Z_QATA00KWBC221605_C_KWIN_20160122161502_000542-3-RADGRTLK.GIF

EMWIN GOES-R File Naming Convention

A_FXUS65KABQ121804AAB_C_KWIN_20160112180901_008996-2-AFDABQNM.TXT

1. **A** – "pflag" on how to decode the product identifier
   - A – Standard WMO product heading follows
   - Z – Originating Center's local product identifier (used for Images)
2. **FXUS65KABQ121804AAB** – WMO Product Identifier
   - T1T2A1A2ii
   - CCCC
   - YYGGgg
   - [BBB]
3. **KWIN** – EMWIN system transmission
4. **20160112180901** – file creation date/time stamp (yyyyMMddhhmmss)
5. **008996** – EMWIN sequence number to ensure uniqueness.
   - Increment by 1 for each new file. Range: 000000 through 999999; then back to 000000
6. **2** – Priority, with range 1-4 (highest to lowest)
7. **AFDABQNM.TXT** – old GOES-N file name

See EMWIN (DRAFT) GOES-R Filename Convention:
http://www.nws.noaa.gov/emwin/EMWIN_GOES-R_filename_convention_160225-0900a.pdf

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EMWIN ByteBlaster Internet File Push

- Byte Blaster:
  - Client/Server Internet Based Service (NWS is one of many participants)
    - Client software is used to receive products from other servers
    - Local server may have many clients - when a file is received it is immediately re-distributed
    - A server may collect products from different sources (e.g., satellite broadcast, local LAN, or as a client to another ByteBlaster server)
    - Multiple daisy chains are possible: Server -> Client/Server -> Client/Server ->…
  - LoadMaster (NWS)
    - Agent for load balancing clients on registered servers
    - Assists in reassignment of clients when a registered server is no longer active
- Future Service Outlook
  - Windows-based ByteBlaster severs are not supported in NWS IDP environment.
  - NWS is actively seeking an external successor to continue ByteBlaster operational services in the future

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New File Names and Time Intervals for EMWIN FTP Service

TYPE	Present EMWIN FTP Service	Future EMWIN FTP Service
TEXT	**Two minute**: twomin.zip	txtmin02.zip
	Five minute: fivemin.zip	**Six minutes**: txtmin06.zip
	Fifteen minute: fifteen.zip	**Twenty minutes:** txtmin20.zip
	One Hour: onetext.zip	txthrs01.zip
	Three hour: threetxt.zip	txthrs03.zip
IMAGES		**Fifteen minute**: imgmin15.zip
	One hour: oneimage.zip	imghrs01.zip
	Three hour: threeimg.zip	imghrs03.zip

Future Enterprise EMWIN (eEMWIN) File Transfer Protocol (FTP) Service

- Compressed sets of EMWIN files grouped by time interval
- Anonymous FTP servers – account/registration is not required
- Separate GOES-N and GOES-R services to support the two different file naming conventions
- Implementation Date: On or about June 2017

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EMWIN & ISCS Events Calendar

Date	Description
Aug 30, 2016	NWS EMWIN Stakeholder Webinar (1400 EDT / 1800 UTC)
Nov 4, 2016	GOES-R launch -- 1743 EDT (2140 UTC)
Feb/Mar 2017	GOES-R HRIT/EMWIN Post Launch Testing (PLT) - EMWIN End User participation and reports
2017	NESDIS/NWS decision to deploy GOES-R to East or West
2017	GOES-R placed on station (East or West) & declared operational

Footnotes

- NWS EMWIN Web Page:
  - http://www.nws.noaa.gov/emwin/
- EMWIN Support :
  - nws.emwin.support@noaa.gov
- ISCS Web Page:
  - http://www.nws.noaa.gov/iscs/index.html
- NWWS EUC software can be used to receive US local, state, national, regional and global products from the Internet and by satellite broadcast. To request an NWWS Open Interface User Account and the no-cost End User Client Software:
  - Account - User ID and Password: http://www.nws.noaa.gov/nwws/#NWWS_OI_Request
  - EUC Software Request: http://www.nws.noaa.gov/nwws/#NWWS_EUC_Request

Questions

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